MODIS
SCIENCE DATA SUPPORT TEAM
PRESENTATION

December 13, 1991

AGENDA

1. Action Items
2. MODIS Airborne Simulator (MAS)
3. MODIS At-Launch Science Product Generation
4. TEG Status
5. MODIS Team Leader Computing Facility Plan

ACTION ITEMS:

08/30/91 [Lloyd Carpenter and Team]: Draft a schedule of work for the next 12 months. Include primary events and milestones, documents to be produced, software development, MAS support, etc. (The work Plan is being entered into Microsoft Project.) STATUS: Open. Due date 09/27/91.

10/04/91 [Phil Ardanuy and Team]: Prepare questions for the project to characterize the spacecraft position and attitude knowledge and the MODIS pointing knowledge in a way that will facilitate the evaluation of methods such as image registration to meet the science team requirements for earth location. (The letter to the project was prepared, 10/28/91.) STATUS: Open. Due date 10/18/91.

12/06/91 [Liam Gumley]: Investigate a cataloguing scheme for the MAS data. Consider the Master Catalogue, PLDS and PCDS. STATUS: Open. Due date 02/14/92.

12/06/91 [Liam Gumley, Tom Goff, Ed Masuoka]: Develop a plan for storing and distributing MAS data. STATUS: Open. Due date 02/14/92.

12/06/91 [Ed Masuoka]: Arrange for the "QA" company to come in and give a demonstration of their Performance Analysis Tool. (Demonstration is scheduled for 10:10am Thursday, December 19,1991.) STATUS: Open. Due date 12/20/91.

12/06/91 [Al McKay]: Set up a meeting with Al Fleig to go over the TLCF functions. STATUS: Open. Due date 12/13/91.

MODIS Airborne Simulator status (Liam Gumley)

Progress up to 12 December 1991

Several updates and changes were made to the MAS processing code this week, in order to cope with new information about the MAS and to provide further enhancements to the VAX and IRIS versions of the code.

Calibration
Calibration data for the MAS visible/near-IR channels was received from Tom Arnold (GSFC 913.0) on 11/9. This was incorporated easily into the MAS configuration file. However the data provided was normalized for an instrument gain of 1.0, necessitating a change to the processing code to accommodate different gains in the visible/near-IR MAS channels. In summary, the calibration algorithms are

radiance = count * slope + intercept (used in the past for MAMS),
radiance = (count * slope + intercept) / gain (used for MAS).

It should be noted that the present set of calibration data for the visible/near-IR channels is only preliminary. Tom Arnold is waiting for some further MAS characterization data from Ames, including scan mirror spectral reflectance, results of a MAS cold chamber test, and complete MAS Level-0 data from the integrating sphere runs in Houston.

Level-1b data production
The code that produces netCDF output files on both the VAX and IRIS was modified to include full instrument configuration in the output data set. The geolocation data and calibration slope/intercept data was changed from INTEGER*4 (scaled) to REAL*4 to extend precision. This makes no change to the size of the output file, and extends the stored precision of the data.

Preliminary data distribution prototype
At present, we have the capability to produce subsampled, binary images from netCDF MAS Level-1B data files on the IRIS. In order to get users familiar with the netCDF files and the code needed to access them, we propose that an anonymous FTP account be set up on a LTP IRIS which would be accessible by Mike King, Dorothy Hall, and John Barker. This account would contain (in it's first incarnation)

(1) one MAS flight track	(netCDF file)
(2) ncdump	(netCDF dump utility, executable)
(3) sub	(netCDF MAS image file subset utility, executable)
(4) sub.c	(C source code for sub, Iris version)
(5) libnetcdf.a	(netCDF V1.17 library, Iris version)
(6) netcdf.h	(netCDF V1.17 header file)
(7) netcdf.doc	(ASCII document explaining how to obtain netCDF sources).

After downloading these files by FTP, a user could
(1) Dump the contents of the netCDF files using ncdump,
(2) Create a subsampled image using sub,
(3) Modify sub.c to extract other portions of the netCDF data (e.g. geolocation)
(4) Obtain the netCDF source code and documentation from UCAR.
Mike King, Dorothy Hall and John Barker all have access to IRIS workstations, so this process could get underway rapidly. This would give users their first look at the netCDF output data, and get them started on using the netCDF libraries.

Processing

Currently data from the flight on 12 November 1991 has been processed to Level-1B output. Data from the flight on 14 November 1991 is in processing. At present it appears that the optimum processing setup will be to have the Level-0 data reside on the VAX, and for the Level-1B processing to proceed on the IRIS using NFS mount to obtain the Level-1A data from the VAX. For comparison, production processing runs on both the LTP VAX 11/780 (LTP3) and LTPIRIS2 were performed using the same version of the processing software. To create a 48781 byte netCDF output file (2601 scanlines) the VAX required approximately 3 hours, while the IRIS required around 25 minutes. Thus it appears that the IRIS is a more desirable platform for MAS processing.

MAS FIRE data status

The MAS flew FIRE missions on the following dates:

Date	Area covered	MAS data received	INS data received
11/12/91	Ferry flight to Houston	yes (subset)	yes
11/14/91	Coffeyville, Kansas	yes	yes
11/18/91	Coffeyville, Kansas	yes	yes
11/21/91	Coffeyville, Kansas	yes	yes
11/22/91	Coffeyville, Kansas	yes	yes
11/24/91	Gulf coast, Louisiana	no	yes
11/25/91	Coffeyville, Kansas	yes	yes
11/26/91	Coffeyville, Kansas	yes	yes
12/03/91	Gulf coast, Louisiana	no	no
12/04/91	Coffeyville, Kansas	no	no
12/05/91	Coffeyville, Kansas	no	no

(one other possible)

The following output is generated by the VAX netCDF NCDUMP utility for the straight line flight track from the 11/12/91 MAS flight.

```
>ncdump -h s:ft01.cdf
netcdf s:ft01 {
dimensions:
      Time = UNLIMITED ; // (2601 currently)
      NumberOfChannels = 12 ;
      NumberOfPixels = 716 ;
      HeaderLength = 80 ;
      AnchorIndexSize = 73 ;

variables:
      char DataSetHeader(HeaderLength) ;
      short AnchorPtIndex(AnchorIndexSize) ;
      short DataFrameStatus(Time) ;
      long ScanLineCounter(Time) ;
      long ThumbWheelSwitches(Time) ;
      short ScanRate(Time) ;
      long GMTime(Time) ;
      short S-BendIndicator(Time) ;
      short AircraftRollCount(Time) ;
      long Year&DayOfYear(Time) ;
      short BlkBdy1Temperature(Time, NumberOfChannels) ;
      short BlkBdy2Temperature(Time, NumberOfChannels) ;
      short AmplifierGain(Time, NumberOfChannels) ;
      short BlkBdy1Counts(Time, NumberOfChannels) ;
      short BlkBdy2Counts(Time, NumberOfChannels) ;
      float CalibrationSlope(Time, NumberOfChannels) ;
      float CalibrationIntercept(Time, NumberOfChannels) ;
      float PixelLatitude(Time, AnchorIndexSize) ;
      float PixelLongitude(Time, AnchorIndexSize) ;
      float SensorZenithAngle(Time, AnchorIndexSize) ;
      float SensorAzimuthAngle(Time, AnchorIndexSize) ;
      float SolarZenithAngle(Time, AnchorIndexSize) ;
      float SolarAzimuthAngle(Time, AnchorIndexSize) ;
      float AircraftLatitude(Time) ;
      float AircraftLongitude(Time) ;
      float AircraftHeading(Time) ;
      float AircraftAltitude(Time) ;
      float AircraftPitch(Time) ;
      short CalibratedData(Time, NumberOfChannels, NumberOfPixels) ;
}
```

MODIS AT-LAUNCH SCIENCE PRODUCT GENERATION ALGORITHM INTEGRATION AND OPERATIONAL TESTING

1.0 INTRODUCTION

The MODIS Science Team Leader is responsible for integrating and testing the science data processing (standard product generation) software from all Science Team Members. This includes efficient, effective provision of source codes for all algorithms being developed, documented according to agreed-upon standards (see Section 1.4)[1]. This report proposes an evolutionary, incremental approach towards the development and testing of an integrated MODIS processing system for delivery to EOSDIS.

1.1 An Evolutionary Implementation

Figure 1 illustrates a 3-D volume, termed "Prototype Space," which describes the domain of evolution of the MODIS science data processing system. The ultimate goal is the delivery to EOSDIS of the comprehensive, launch-ready system in early 1998 (see Section 1.2). The final configuration of the processing system is unknown at this time, but may include independent processing packages, or "subsystems," for Level-1A, Level-1B, Level-2 Land, Level-2 Oceans, Level-2 Atmosphere, and Level-3 for each of the disciplines. These packages may execute on an orbital basis for Level-1A and a multi-orbital basis for Level-1B. Ancillary data dependencies will dictate the execution of the Level-2 packages (e.g., orbital for land and atmosphere, daily for oceans). Averaging interval and technique will dictate the execution at Level-3 (e.g., daily and monthly for most products, weekly for snow/ice cover, sea surface temperature, and vegetation indices). Level-4 product algorithms, such as a forest biogeochemical model or oceanic primary production, may not form a part of the launch-ready code.

The back face of the cube represents the fully diverse, mature, (Version-3) processing system as delivered to EOSDIS. Efforts to reach this goal begin at a point (Level-1, Atmosphere, December 1991) using the MODIS-N Airborne Simulator (MAS) processing system as a surrogate for MODIS. The plan is to proceed in steps from the front face of the cube to the back. At each step, additional processing levels are included, additional functionality is added through the incorporation of more mature science algorithm versions, and/or additional algorithms or disciplines are included.

1.2 Launch Date

The launch date presently carried for MODIS-N is December 1998. However, a restructured EOS mission has been proposed by the Payload Advisory Panel. The recommended implementation of the EOS measurement suite includes both morning and afternoon sun-synchronous NASA platforms. A MODIS-N instrument is proposed for each platform. These

[1]MODIS Team Leader Statement of Work: Execution/Operations Phase, May 21, 1991

platforms will provide for 15 years of Earth observations through two series of three overlapping five-year flights. In addition to MODIS-N, the cluster of instruments proposed for the AM flight includes ASTER, CERES, and MISR, while the PM cluster additionally includes AIRS/AMSU-A/MHS, CERES, and MIMR.

The MODIS Science Team is therefore faced with two launch dates, one for each instrument cluster. Under one scenario, the AM instrument cluster would be launched first, and perhaps earlier than December 1998, with the PM cluster launched some 20 months later. While different science goals have been established for the two instrument clusters, there is some overlap. The AM cluster will focus on cloud and aerosol radiative properties, and air-land exchanges of energy, carbon, and water. The PM cluster will allow the study of cloud formation, precipitation, and radiative properties, as well as air-sea fluxes of energy and moisture.[2] It is possible that the suites of MODIS product generation algorithms will not be identical for the two instrument clusters.

Due to reduced cloud cover in the morning, the AM MODIS would offer the greatest ability to image the Earth's surface, thereby providing the primary science capability for the MODIS Land discipline. For the associated data reduction, requirements for atmospheric correction of the observed radiances over land will necessitate input moisture (and possibly temperature) profiles, as well as other atmospheric constituents (e.g., aerosols, total ozone, surface pressure). Due to the larger solar insolation and cloud amount, the PM MODIS will offer the greatest opportunity to study clouds and radiation (though complemented by the AM orbiter data). Both the AM and PM orbits offer observing advantages to the MODIS Ocean discipline for different areas of the Earth.

Given the changing nature of the EOS instrument accommodations (selection, launch vehicle, orbital platform, and launch date) we will carry the December 1998 launch date for the remainder of this document. The plans are flexible in nature and can be easily modified to accommodate any instrument configuration.

1.3 Axioms and Imperatives

The Version 1 deliverable for ECS will not be developed in one pass. Rather, multiple prototypes and incremental enhancements will be produced, each using the former as a foundation.

Porting of the shell scripts for product generation (e.g., file management, I/O) will likely be at least as challenging as the science algorithms. In fact, one can consider the C or FORTRAN code and the accompanying UNIX shell as together comprising the algorithm.

A "pathfinder" set of MODIS science data product algorithms can be used to advance the readiness of the integrated MODIS prototype. Early prototype science algorithms will undergo considerable modification over the next decade. By using object-oriented techniques to the

[2]Payload Advisory Panel Recommendations, November 8, 1991, Berrien Moore, Chairman.

extent practical, the ability to cope with the "complexity and mutability" of rapidly evolving science software will be increased.[3]

MAS science data processing is an early surrogate for MODIS data processing. However, at some point the two data systems will diverge.

The burden placed upon Science Team Members should be minimized. However, the team member involvement throughout the development of the system, with oversight and review responsibilities, is an essential ingredient for success.

1.4 ECS Deliverables

The MODIS science data processing software development and validation schedule will be consistent with the ECS Science Software Development Schedule. It will be based upon the three initial software versions required prior to launch:

- Version 1 (V1)--launch minus 33 months: This delivery will test the migration path from SCFs to the EOSDIS environment. Programs should be as complete as possible but should at least simulate the computational scope, job size, and storage envisioned for the final products. This version should exercise interfaces with EOSDIS and execute as if in an operational environment.

- Version 2 (V2)--launch minus 21 months: This delivery will result from all lessons learned during V1 integration and testing and continued development. Minimally, programs should be a refinement of V1 and demonstrate a complete operator interface, including the generation of all messages using standard error and message services. This version will require realistic resources, near the actual requirement.

- Version 3 (V3)--launch minus 9 months: Programs should be launch ready. Following integration and test of the software, final operations procedures testing and training will be completed with Team Leader support.

Each delivery will include software, test data, user's guide, operations guide, and software version description.

1.5 Simulated MODIS Data

Simulated MODIS-N data will be used to support the rigorous operational testing and integration of MODIS standard product science algorithms prior to delivery to EOSDIS, and will ensure their successful operation following launch. Utilization of realistically simulated MODIS data, in conjunction with consistently simulated ancillary data, will permit tests of all possible paths within the data product algorithms, and will also obtain reliable estimates of the resource requirements of the algorithms. Generation of simulated MODIS-N data for supporting

[3]Comments on "Standards and Guidelines for Science Data Processing Software, J. Dozier and J. Frew, 1990.

algorithm integration and operational testing is expected to be an iterative, coordinated activity involving MODIS science team members from the land, ocean, atmosphere, and calibration disciplines, and possibly collaboration with science team members from related instruments (e.g., AIRS/AMSU, CERES, MISR, and ASTER) and coordination with the EOS Modeling Panel.

MODIS-N data simulations may use either surrogate data, such as from the MAS, or computer models. In the latter, an Earth description and associated geophysical fields are used to generate spectral radiances, which are then propagated through orbital and instrument models. MODIS instrument errors and other artifacts are introduced into the observations. The simulated data are then applied to the science algorithms to operationally test the algorithms and create simulated data products. The process will be iterated as early algorithm prototypes are improved and as new versions of integrated MODIS N standard product generation software packages are prepared for delivery to EOSDIS. It is likely that early simulations using solely MAS data will be replaced by more comprehensive instrument treatments in later iterations.

2.0 IMPLEMENTATION STEPS

Figure 2 (three pages) provides a set of five steps that lead to a complete integrated MODIS processing system. Step I exists today as Version 1.0 of the MAS Processing System. Step V represents Version 1 of the MODIS-N launch-ready integrated code (to be delivered to the ECS 33 months before launch).

2.1 MAS Level-1 Processing System (Version 1.0)

As illustrated in Step I of Figure 2, the earliest MODIS-N processing system prototype performs Level-1 processing on MAS data. Dual data streams of instrument telemetry and Inertial Navigation System (INS) data are merged, navigation and calibration are performed, and NetCDF formatted output is produced. Version 1.0 of the MAS processing system is presently operational.

2.2 MAS Level-1 Processing System (Version 1.extended)

As illustrated in Step II of Figure 2, Version 1.Extended of the MAS processing system allows the generation of metadata for each data granule, as well as reduced resolution summaries for the identification of cloud coverage, snow cover, etc. The addition of browse and metadata utilities extend the capability of the prototype. This functionality is expected in March/April 1992. Segments of the MAS processing system for data cataloging, archiving, and distribution may fall outside the scope of this integration and testing effort.

2.3 MAS Level-1 Processing System (Version 2.0)

Version 2.0 of the MAS processing system accommodates the planned 50 channel capability of the MAS. This functionality is expected to be in place by June 1992.

2.4 MODIS At-Launch Version 1 "Double Prime" (V1'')

As illustrated in Step III of Figure 2, Level-2/3 science algorithms have been integrated into the Level-1 MAS (simulated MODIS-N) data stream. The precise mixture of algorithms and involved Science Team Members is TBD, but will likely be limited to a subset of the MAS investigators from the Atmosphere and Land disciplines. Algorithms will be solicited in "as is" condition, with a recognized expectation of substantial change and complete replacement in the future. Some minimal to moderate TBD ancillary data requirements are expected. The expected availability date is December 1992.

2.5 MODIS At-Launch Version 1 Prime (V1')

As illustrated in Step IV of Figure 2, by September 1994 a reasonably complete set of algorithms from the MODIS Atmosphere and Land disciplines have been integrated into distinct Level-2 and Level-3 processing packages. Moderate ancillary data requirements may exist. MAS data is still portrayed as the input Level-0 data, though alternative modelled/simulated data may be substituted. Though not shown until Step V, discrete Level-1A and Level-1B packages could be incorporated here, along with more advanced calibration algorithms. If desired, this version of the MODIS processing system could be made available to the ECS contractor.

2.6 MODIS At-Launch Version (V1)

Version 1 of the MODIS-N science data processing system is illustrated as Step V of Figure 2. The delivery by the MODIS Science Team Leader of Version 1 of the MODIS science data processing software to the ECS will take place 33 months before launch (March 1996). Integration of the individual Science Team Member algorithms into the complete system is expected to begin TBD (6-12 months, depending on the maturity of V1') prior to this date (March-September 1995).

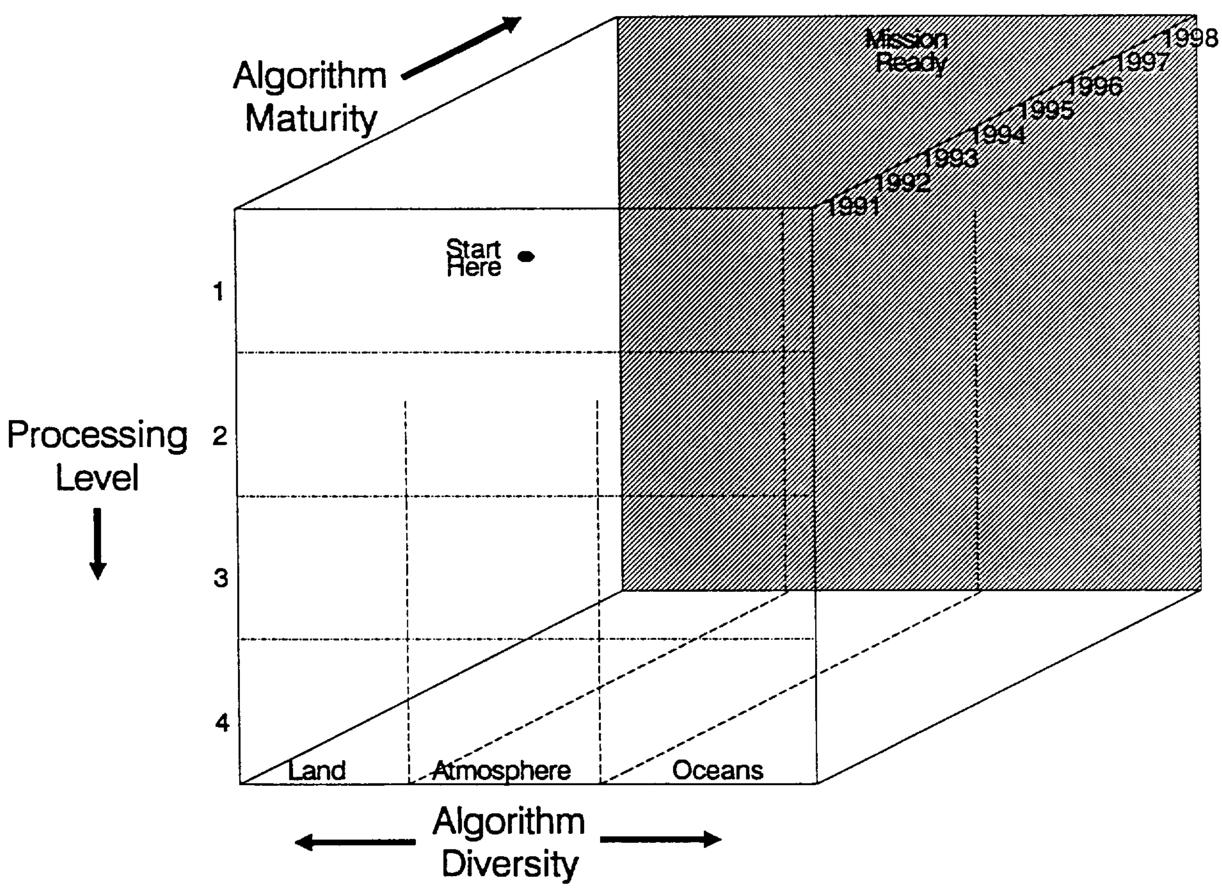
2.7 MODIS At-Launch Version (V2)

The delivery by the MODIS Science Team Leader of Version 2 of the MODIS science data processing software to the ECS will take place 21 months before launch (March 1997). Integration of the individual Science Team Member algorithms into the complete system is expected to begin TBD (6-12 months, depending on the maturity of V1) prior to this date (March-September 1996).

2.8 MODIS At-Launch Version (V3)

The delivery by the MODIS Science Team Leader of the mission-ready MODIS science data processing software to the ECS will take place nine months before launch (March 1998). Integration of the individual Science Team Member algorithms into the complete system is expected to begin TBD (6-12 months, depending on the maturity of V2) prior to this date (September 1997).

Figure 1



MODIS DATA SYSTEM

PROTOTYPE SPACE

Figure 2

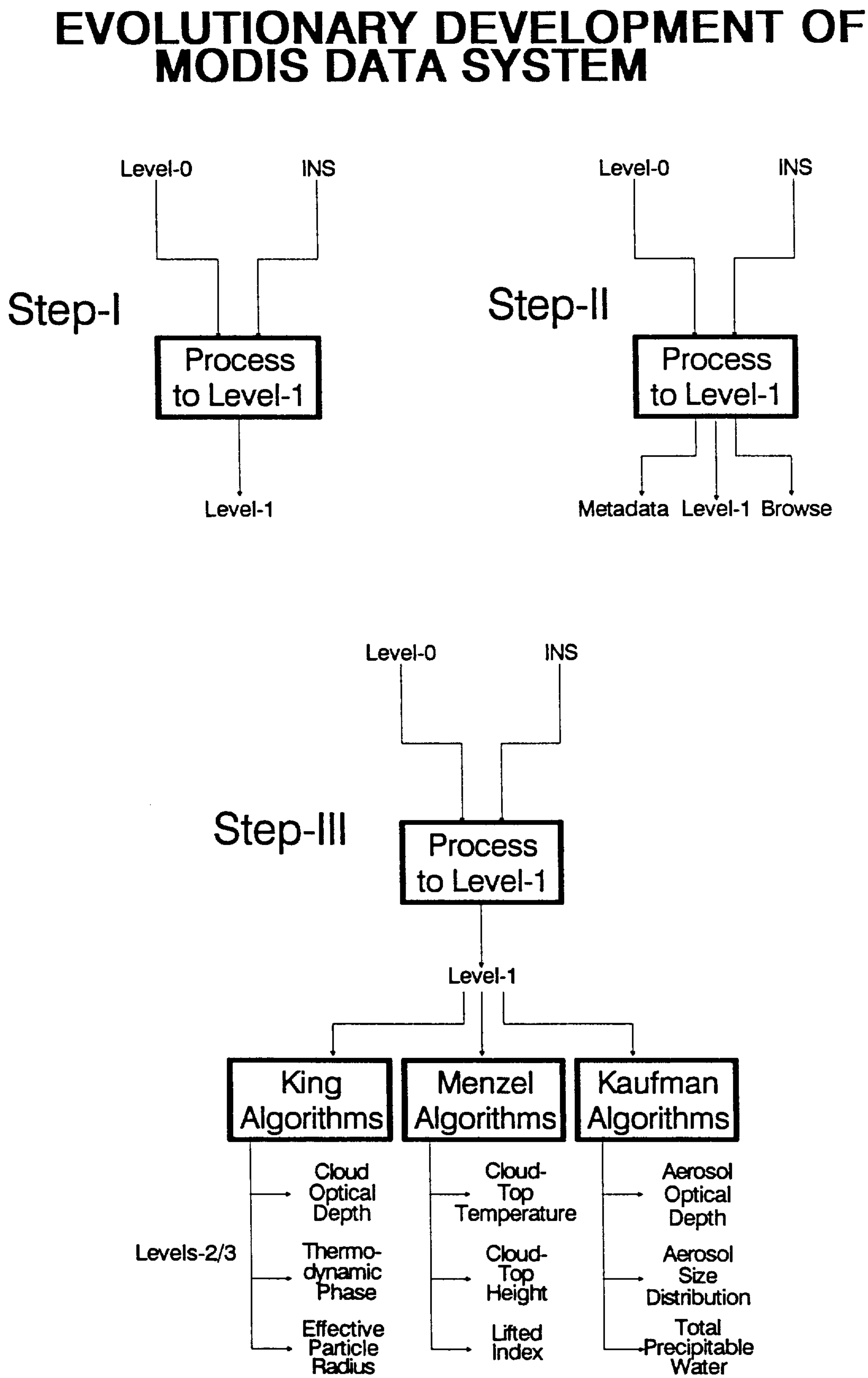

EVOLUTIONARY DEVELOPMENT OF MODIS DATA SYSTEM
Step-I
Level-0
INS
Process to Level-1
Level-1
Step-II
Level-0
INS
Process to Level-1
Metadata
Level-1
Browse
Step-III
Level-0
INS
Process to Level-1
Level-1
King Algorithms
Menzel Algorithms
Kaufman Algorithms
Levels-2/3
Cloud Optical Depth
Thermo-dynamic Phase
Effective Particle Radius
Cloud-Top Temperature
Cloud-Top Height
Lifted Index
Aerosol Optical Depth
Aerosol Size Distribution
Total Precipitable Water

Figure 2

EVOLUTIONARY DEVELOPMENT OF MODIS DATA SYSTEM (CONTINUED)

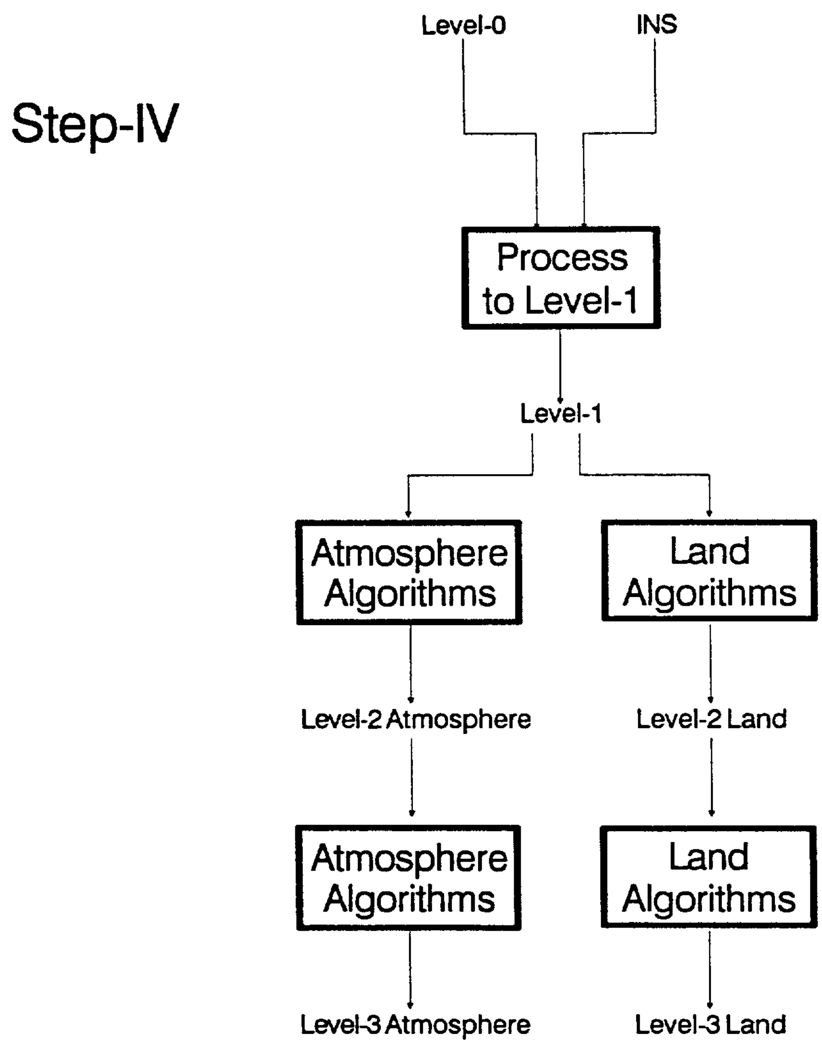
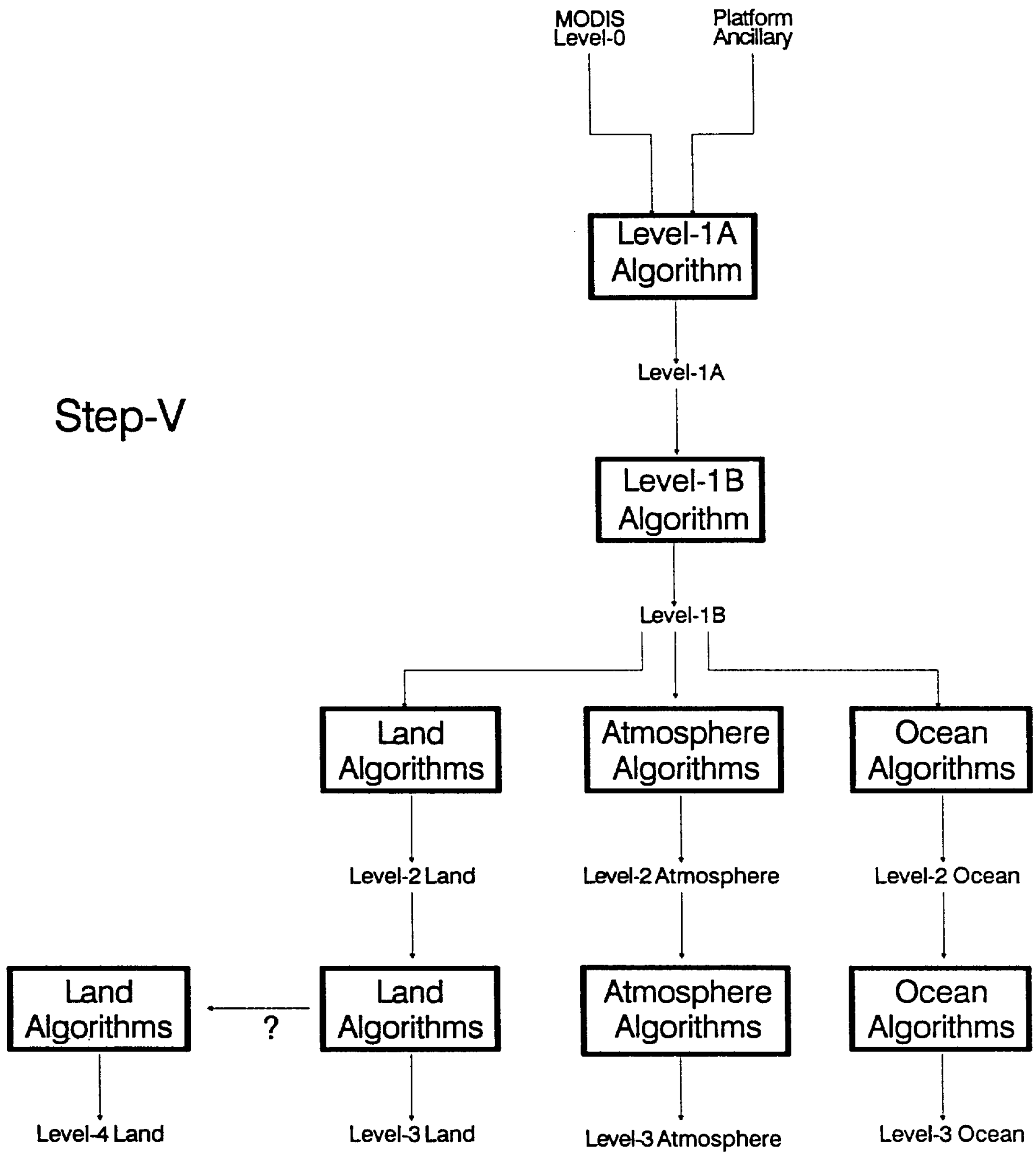


Figure 2

EVOLUTIONARY DEVELOPMENT OF MODIS DATA SYSTEM (CONTINUED)



Tom Goff's Status
for
12 December, 1991

TGoff on GSFC mail, or teg@LTPIRIS2.GSFC.NASA.GOV

* HDF newsletter notes: NCSA has looked into fitting the NetCDF data model into HDF. This work was performed by a graduate student this past summer. They currently have a proposal pending to NSF to perform this task. NCSA's highest priority is to add support for 8-bit integers, 16-bit integers, 32-bit integers, 32-bit floats, and 64-bit floats in HDF. This is a current activity and should produce results shortly!

* An even newer version 2.01 of the NetCDF library has just been announced for distribution by UCAR.

* A first version of a utility to subset NetCDF image data has been written and will be made available to the user community. Following this utility will be a function to import NetCDF image files into the PCI EASI/PACE image database.

* Considerable effort was expended in successfully interfacing FORTRAN mains and C subroutines on both the VAX and IRIS computers. Knowledge of parameter passing techniques for all data types including character types was gained.

DISCUSSION ITEMS

* We would like to assemble a list of coding documentation innovations and suggestions as a discussion item for all Team Members and interested parties. Perhaps we can post some code "targets for criticism" on the MODIS bulletin board.

c:\modis\status.wp

The C.A.S.E. Environment

Thomas E. Goff
12 December, 1991
teg@ltpiris2.gsfc.nasa.gov

A discussion of CASE tools for use in designing and implementing the MODIS processing portions of the EOSDIS system.

Computer Aided Software Engineering (CASE) tools consist of a suite of computerized methods to help a system designer or programmer to create and maintain computer applications. The target audience of CASE tool users can be segmented into commercial (business) and non-commercial (technical) users. Commercial users historically use COBOL languages to design transaction systems (many terminals that utilize very little CPU time). Non-commercial users are the developers of computer systems, databases, microprocessor applications, and scientific applications (a few users performing heavy computation). CASE tools targeted to commercial users do not perform the same functions a CASE tools targeted to non-commercial users. The vast majority of CASE tools is target to these commercial users. The remainder apply towards the rest of us.

There are six types of CASE tools:

Front-end or upper CASE - the analysis and design tools such as "EasyCASE", "Teamwork" or "Software Through Pictures". These utilize diagrams and differing design methologies and can be used on a design computer that is independent of the implementation computer. For example: the MODIS level-1 system design diagrams were produced by EasyCASE on an IBM PC clone.

Middle CASE - prototyping and fourth generation languages. These are primarily used in developing commercial applications. Examples would be forms generation packages for report writers or dynamic graphical process interconnections. These may be of use in the later stages of the MODIS or EOSDIS system, but are of limited use in the near term.

Back-end or lower CASE - These are the actual creators and debuggers of programming code. They are machine specific.

Reverse engineering - Fixing, and/or modifying existing code. These are used to understand, clean up, and increase the performance (decrease the complexity) of code that already exists. McCabe's performance analyzers are examples of this category.

System management - This software handles the configuration management (CM) which includes check-in and out of software modules, updating of execution modules, module change control and protection, and automatic revision control. A limited amount of this capability is included in most front-end tools.

Environment - The frame work that allows all the above tools to talk to each other in a user transparent manner. For example: changes to a module of code would be automatically diagrammed in the structure diagrams. HP's SoftBench is the best example of this capability.

Following the installation of a CASE implementation, a methodology applicable to the task at hand (area of use) is chosen. The decision among CASE techniques is determined by the form of the application programs to be written: Normal or non-real-time with no control mechanisms, Real-time with control mechanisms (both of these for both commercial and technical arenas), and Embedded real-time.

Shopping List for Near-Term TLCF

Hardware:

UNIX Workstation with Ethernet Support
64 MB RAM
15 GB Hard Disk Storage
CD-ROM Reader
MO/WORM Optical Drive
Publication Quality B/W Postscript Printer
Color Output Device
9-Track 6250 bpi Tape Drive (2 req'd)
Exabyte (8mm) Tape Drive
QIC Tape Drive
Ethernet Bridge
Uninterruptible Power Supply

Operating System Essentials:

UNIX with Berkley Extensions (Any variety, Posix compatible in the '95 timeframe)
TCP/IP
X-Windows (X-11, Revision 4 minimum)
SLIP Protocol Support (Compressed SLIP [CSLIP] preferred)

Near-Term Communications Requirements for the MODIS Team Leader SCF

Function	Remote Site	Environment	Protocol	Medium	Rate (Kbps)	Standard
Remote SDST Support	Local	X-Windows/MOTIF	CSLIP	Phone Lines (4)	14.4	V32bis, V42bis
Run CASE Tools	SCFs	X-Windows/MOTIF	CSLIP	Phone Lines (3)	14.4	V32bis, V42bis
			TCP/IP	Internet		
Project Management Tools	Local		TCP/IP	Goddard Network		
ECS Toolkit Evaluation (Beta Testing)						
ESN Toolkit	PGS			ESN		
SMC (CASE) Toolkit	PGS			ESN		
IMS Toolkit	PGS			ESN		
	Anywhere		TCP/IP	Internet		
	Anywhere		Phone Lines (1)		14.4	V32 bis, V42 bis
Team-Member-Defined Support Processing	SCF		Phone Lines (1)		14.4	V32 bis, V42 bis
Preliminary Data Cataloging and Distribution System	Anywhere		Phone Lines (1)		14.4	V32 bis, V42 bis
Integration with Version-0	DAAC				56	

Software Hierarchy for the Near-Term TLCF

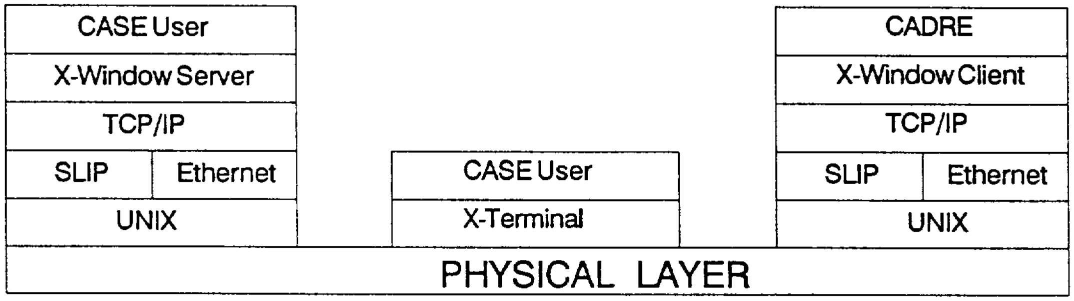


Figure 1. CASE Tool Operation

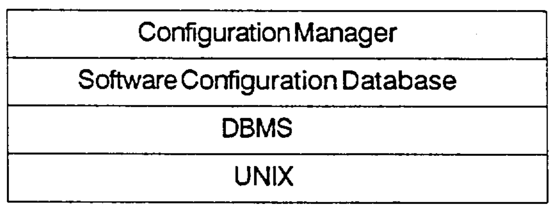


Figure 2. Software Configuration Management

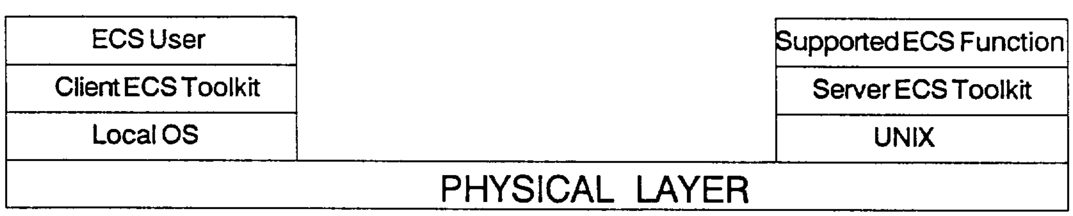


Figure 3. ECS Toolkit Evaluation

Software Hierarchy for the Near-Term TLCF (continued)

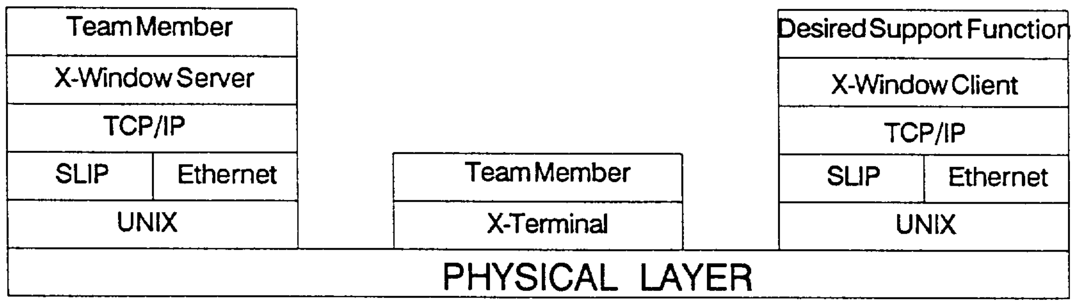


Figure 4. Team Member Support

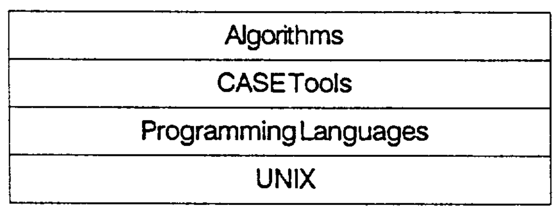


Figure 5. Algorithm Development and Product Generation

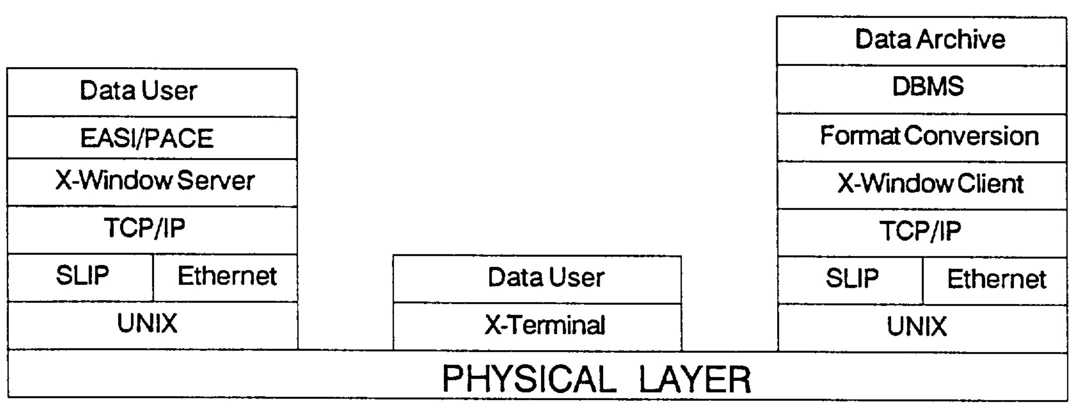


Figure 6. Preliminary Data System Access

SUPPORT NEEDED FROM THE MODIS TLCF: AN INTERVIEW WITH DR. DOROTHY HALL

1. Dorothy expects to use MAS data processed by the SDST for preliminary algorithm development and validation. Data for selected study regions will be solicited from many sources, and for the selected regions, data from all available sources will be compared to identify distinguishing characteristics for the terrain and conditions being studied. Besides MAS data, she hopes to obtain ASAS data, NS001 data, and Landsat data for the selected study regions.

2. The group currently owns an SGI Personal Iris and several personal computers and currently uses VAX processing facilities at the Laboratory for Terrestrial Physics. The available facilities adequately support current programming activities, and unless massively increased funding becomes available to support more programmers, Dorothy does not foresee a need for additional computing resources. Specifically, she does not expect to need computing support from the TLCF in the time period before PGS-compatible hardware becomes available.

3. Dorothy foresees a need to continue multiple-source studies of special regions throughout the launch and post-launch time period. The TLCF may well routinely assist in the validation of snow and ice products in selected regions during this time period. She expects that validation studies in this extended time period will use aircraft data and field work, and will involve processing techniques similar to those currently used.

SUPPORT NEEDED FROM THE MODIS TLCF: AN INTERVIEW WITH DR. MIKE KING

1. Mike expects to use the facilities of the TLCF to do MODIS Airborne Simulator (MAS) processing, but otherwise does not foresee a need to use TLCF computing facilities in the near term (up until the time when a PGS-compatible facility becomes available).

2. Once a PGS-compatible TLCF is available, Mike expects that he and other atmospheric and land scientists will want to use TLCF facilities for high-volume production tasks and for system integration purposes. He expects that the MODIS TLCF will be the primary integration site for the atmospheric and land product generation systems. Atmospheric and land Team Members have expressed a strong interest in accessing the enhanced TLCF facility, and he envisions an active team member role in achieving integrated product generation at the TLCF.

3. Mike expects that MAS and similar programs will continue up through EOS launch time and beyond, and that the processing of MAS and similar data will be an ongoing TLCF function for the foreseeable future. Once real MODIS products become available, MAS and similar study programs will support product validation as well as basic scientific research.

SUPPORT NEEDED FROM THE MODIS TLCF: AN INTERVIEW WITH DR. YORAM KAUFMANN

1. Yoram is not actively using any Goddard computing facility at this time. He is studying data requirements and reviewing potential data sources to determine which data sets are suited to his needs. He expects to obtain some of the required data directly from his own field measurement program, but he does not expect that his measurements will generate a large volume of data and he expects that processing requirements for his field data will be moderate.

2. Yoram is at present undecided about which computing facility he will use. If need be, he can probably access required computing capability from presently-existing Goddard facilities. As an alternative, he might access TLCF facilities when these become available to him.

3. In the launch and post-launch era, Yoram also expects to use TLCF facilities for special study support and routine product validation.